# Durst CM 50

## Operating manual

Durst
PHOTOTECHNIK

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## 1.0.0 General note

The Durst CM 50 Color Meter is an electronic measuring unit to establish filter and density adjustments when enlarging colour negatives.

The CM 50 can also operate just as a density meter and is therefore equally useful for enlarging transparencies and black-and-white negatives.

The CM 50 requires a 5.6 volt battery (PX-23 or similar) which is **not** supplied with the unit. The CM 50 Color Meter can be used with the Durst C 35, M 302, M 305, M 605, M 705 and M 805 enlargers.

The Durst CM 50 is shipped in its original packaging in two parts:

(a) The CM 50 Color Meter
(b) The mounting and diffuser

The package also includes a thin metal ring required with the Durst M enlargers.

**Please note:** If the mains supply is subject to voltage fluctuations, feed the enlarger via a voltage stabiliser. Otherwise Color Meter measurements may yield wrong results.

**Important:** The Durst CM 50 is basically calibrated at the factory. When unpacking the unit please note the **checkout form** which is important in applying the basic calibration.

## 2.0.0 Technical data

Measuring cell: Silicon diode
Colour balance reproducibility: 0.03 (density)
Power supply: One 5.6 volt PX-23 battery

## 3.0.0 Checking out

The Durst CM 50 is supplied in a special package. First of all, check – against the list of components and controls below – that your unit is complete. All separate items are marked with an asterisk.

### 3.1.0 Components and controls

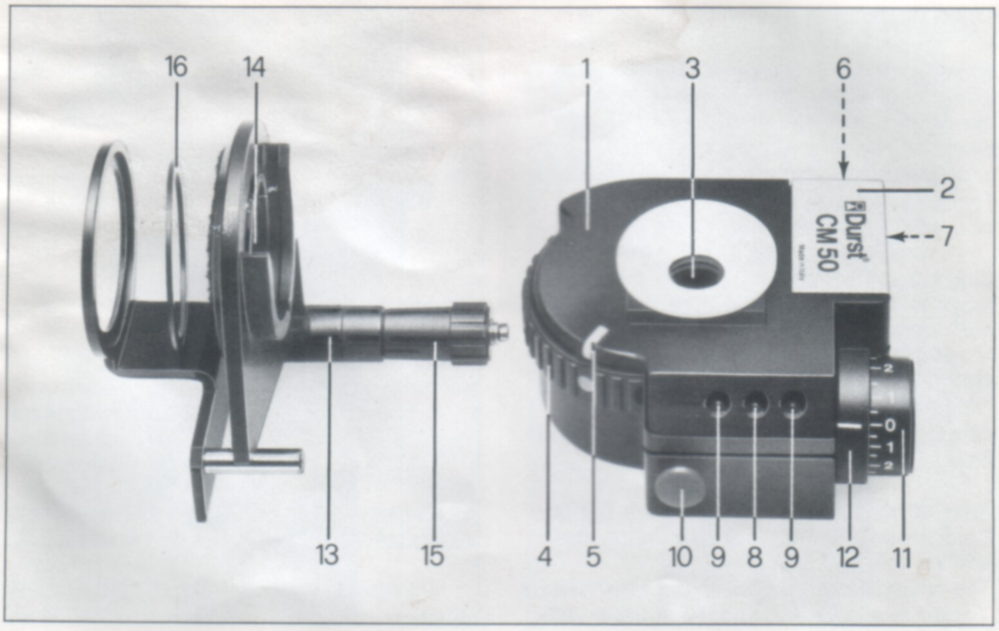
*(1) CM 50 Color Meter
(2) Battery cover
(3) Meter cell
(4) Filter/density selector wheel
(5) Index mark
*(6) Screwdriver
(7) Calibration screw opening
(8) Battery check lamp
(9) Balancing LEDs
(10) Red balance button
(11) Sensitivity control
(12) Reference ring
*(13) Mounting
(14) Diffuser
(15) Vertical adjustment screw
*(16) Spacer ring

### 4.0.0 Inserting the battery

Pull off the battery cover (2) to the rear and remove the screwdriver (6) from its fitting. Insert the battery the right way round: the correct polarity is marked in the bottom of the battery compartment.

### 4.1.0 Battery check

Press the button (10): If the green check lamp (8) does not light or dims noticeably within 2-3 seconds, replace the battery.


16
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Durst
CM 50
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11

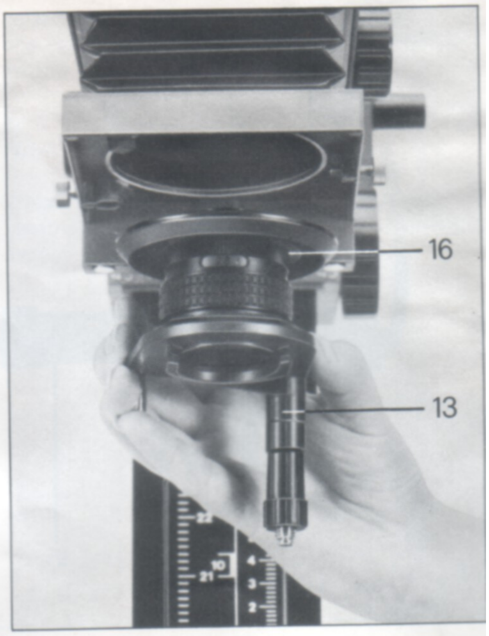
### 5.0.0 Mounting the Durst CM 50

When using the Color Meter with NEONON lenses on Durst M enlargers, first insert the spacer ring (16) in the mounting (13), push the lens through the opening from underneath and screw it into the lens board. Then mount the board complete with the mounting on the enlarger.

Check that the aperture scale of the lens faces to the front. The spacer ring (16) is not necessary with other lenses.

With Durst C enlargers screw the mounting (13) with the lens directly into the lens carrier. The spacer ring (16) is not needed here.

After fitting the mounting, push the CM 50 Color Meter (1) into the guides below the diffuser (14) as far as it will go.
The check lamps (8 and 9) must face forward.
To ensure a light-tight fit of the diffuser with



the CM 50 Color Meter against the lens, adjust the vertical adjustment screw (15) so that the diffuser with the CM 50 Color Meter can just swing out of the way.

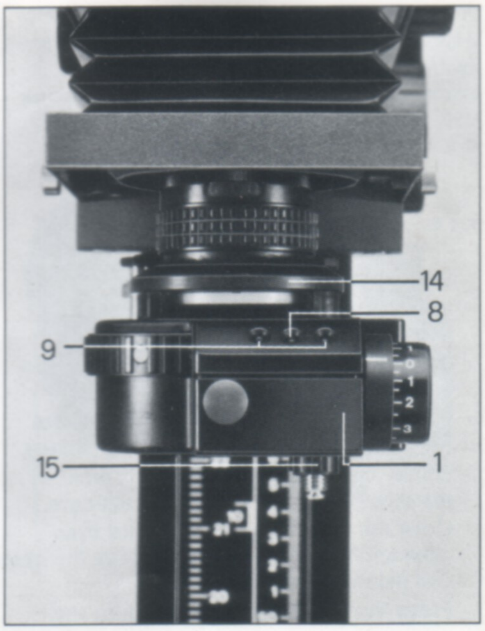
If necessary raise, lower or swing aside the red filter on the enlarger (or even remove it) to permit easy centering of the CM 50 Color Meter.

### 6.0.0 Basic calibration of the Durst CM 50

The CM 50 is pre-calibrated at the factory. This greatly reduces the need for a filter test by the user. In most cases the basic calibration only requires a final fine correction of the filter settings.

The Durst CM 50 calibration is based on Kodacolor II film and Ektacolor 78 RC paper.

For the final calibration use a negative of reasonably even colour distribution, preferably



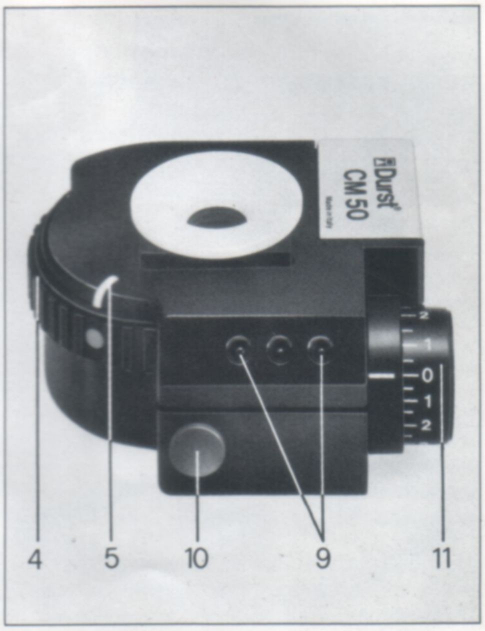
taken by slightly hazy sun and correctly exposed. Ideal are snapshots of street scenes, festival processions etc. Avoid negatives of anomalous colour distribution, for instance with large predominant sky areas. The only colour that may predominate is grey.

### 6.1.0 Analysing the calibration negative

- Switch on the enlarger.
- Insert the calibration negative in the negative carrier.
- Set the filter controls of the colour head to zero.
- Set the enlarger to a medium print size (for instance 20×24 cm or 8×10 inches).
- Focus, then swing the CM 50 in front of the lens. Keep the lens at full aperture.
- Move the filter selector (4) to the cyan channel: Turn the wheel to engage the cyan dot below the white index (5).
- Press the red button (10) and turn the sensitivity control (11) until both LEDs (9) remain alight together.
- Turn the filter selector (4) clockwise to the yellow channel: Engage the yellow dot on the filter wheel below the white index (5).
- Press the red button (10) and increase the yellow filter setting on the colour mixing head until both LEDs (9) remain alight.
- Turn the filter selector (4) further to the magenta channel: Engage the magenta dot on the selector wheel below the white index (5).
- Again press the red button (10) and increase the magenta setting on the colour head until both LEDs (9) remain alight.
- Repeat this measuring sequence, selecting the different filters in the same sequence to balance cyan with the sensitivity control and yellow and magenta with the appropriate filters of the colour head. The two LEDs must light together in each of the three positions.

### 6.2.0 Converting filter values

The filter values on the scales of your colour enlarger should now yield a print without any colour cast on the colour paper used for the factory calibration – in other words on Ektacolor 78 RC with the filter correction values listed on the check list included with the unit. If your paper needs different colour correction values, you have to allow for this difference as described below.



Conversion example:

**KODAK EKTACOLOR 78 RC PAPER (or 74 RC)**

| | Yellow | Magenta | Cyan |
|---|---|---|---|
| Filter correction value on your paper pack, for instance | — 5 | + 15 | — |
| Less:<br>Filter correction value on check list say +10 Y —15 M (subtract by adding with reversed sign) | — 10 | + 15 | — |
| Difference (Kodak values) | — 15 | + 30 | — |
| Difference in Durst values (Kodak value divided by 1.5) | — 10 | + 20 | — |

Now correct the filter settings you obtained while analysing the calibration negative by these values.

### 6.3.0 Exposure tests

- Stop down the enlarger lens by two stops.
- Switch off the room lighting and enlarger lamp.
- Insert the colour paper in the masking frame and make an exposure sequence of different times (for instance 2, 4, 8 and 16 seconds) of a part of the selected enlargement size.
- Process and dry the print.
- From the result establish the correct exposure time required and set this on the exposure timer.

### 6.4.0 Programming the density channel

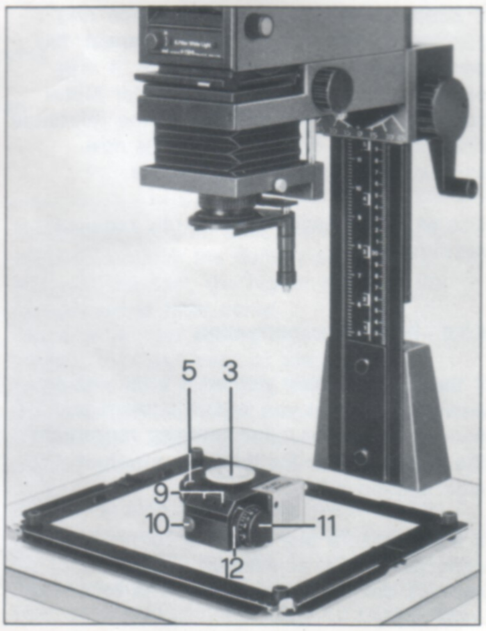
Now program the density channel of the Durst CM 50 in darkness. (The darkroom lamp may remain switched on.) Keep the calibration negative in the negative carrier and do not change the lens aperture, exposure time or magnification settings.

With colour enlargements also keep the same filter settings in the colour head as used for the calibration negative.

Carefully pull the CM 50 Color Meter from its guides on the diffuser, pressing gently against the latter's front edge. Select the density channel – engage the white dot on the filter selector wheel below the white index (5) – and place the CM 50 Color Meter on the baseboard or masking frame with the cell (3) exactly centered below the lens.

Switch on the enlarger lamp and recheck that the diffuser is swung into position.

Press the red button (10) and turn the sensitivity control (11) till both LEDs (9) light up. Now reset the reference ring (12) so that the white index on the ring is lined up with the zero mark on the sensitivity control. Repeat the balancing procedure in case you accidentally moved the sensitivity control (11) while zeroing the reference ring.



If during normal work the reference ring position is accidentally upset, repeat the density calibration. To avoid this, it may be useful to mark the CM 50 Color Meter housing to show the position of the reference ring index. The density channel is now calibrated for further enlargements.

Use of a new paper batch rarely requires reprogramming.

### 6.5.0 Final filter correction

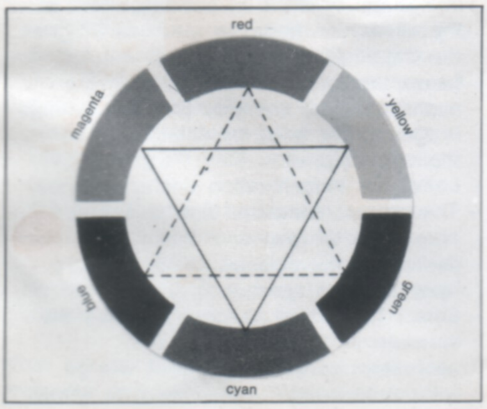
If the exposure test yielded a print without a colour cast but you had to convert and hence correct the filter settings, reprogram the analyser now for these filter values (see section 6.7.0).

If the exposure test shows a colour cast, carry out a final adjustment of the filter settings before programming. The following rules apply:

### 6.6.0 Filter rules – The colour star

**Remove a colour cast by a filter of the same colour.** For instance remove a yellow cast by increasing the yellow filter setting in the colour head.
All colours not indicated in the colour head are obtained by mixing two of the three filter colours of the colour head. Thus yellow and magenta yield red, magenta and cyan yield blue, yellow and cyan yield green. Mixing all three filter colours creates only neutral density which has no filtering effect and thus merely increases the exposure time. **In principle therefore use always only one filter colour or combine two, but never three, filters.**

| Colour cast | Increase | Reduce |
|---|---|---|
| Red | Yellow and magenta | Cyan |
| Green | Yellow and cyan | Magenta |
| Blue | Magenta and cyan | Yellow |
| Cyan | Cyan | Yellow and magenta |
| Magenta | Magenta | Yellow and cyan |
| Yellow | Yellow | Magenta and cyan |



To remove a colour cast, the filter density must also match the density of the cast. The stronger the cast, the higher must be the compensating filter value.
Too high a filter setting – overfiltering – causes a colour cast in the filter's complementary colour. In this case reduce the density of the filter colour complementary to the cast. Blue is complementary to yellow, green to magenta and red to cyan.

All this sounds much more involved than it is. The colour star and the table summarize the relationships involved. For intermediate hues use different proportions of the two filter colours. For instance more yellow and less magenta yields orange. (Most RC and PE papers – resin-coated colour papers – need only yellow and magenta filtration.) You will rarely get the filter settings right at the first attempt. But you can eliminate a colour cast by making an exposure series (for instance with the COMASK multiprint masking frame) at different filter settings.

Preferably start with large filter value differences and bracket the correction with finer differences until you have a neutral print. For reliable filter test comparisons, the prints must be of similar density. As filters absorb light, a higher filter setting means that less light reaches the baseboard.

**So any change in the filter setting also requires an adjustment of the exposure time or the lens aperture.**

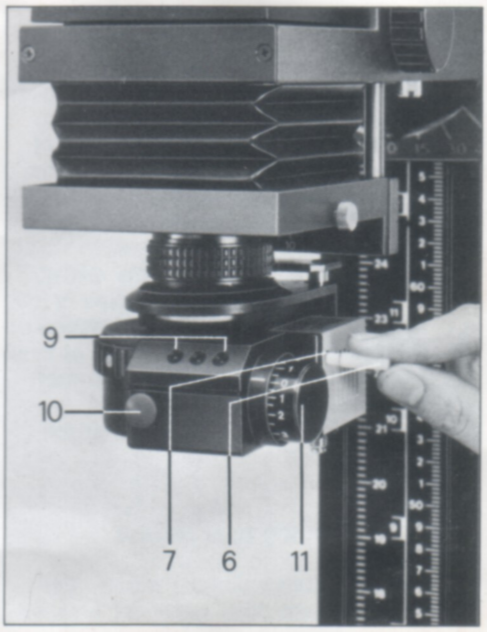
With the CM 50 you can also measure the image brightness or density (see section 6.8.0). Once the CM 50 is programmed for a correct exposure time, it almost always yields prints of correct density irrespective of the filter settings used.

### 6.7.0 Programming the Durst CM 50

- Once you have a correctly filtered 20×25 cm or 8×10 inch enlargement of the calibration negative, you can program the CM 50 Color Meter.
- Leave the calibration negative in the negative carrier and keep the filter settings in the colour head as established for the correct print.
- Leave the magnification unchanged, too.
- The correct exposure time is already entered in the exposure timer.
- Switch on the enlarger lamp and fully open the lens aperture.
- Select the yellow channel and use the screwdriver (6) to screw out the calibration screw as far as it will go without blocking the filter selector wheel.

- Swing the CM 50 Color Meter below the lens.
- Press the red button (10) and turn the sensitivity control (11) till both LEDs (9) light. Do not however touch the reference ring (12).
- Select the magenta channel, press the red button (10), introduce the screwdriver (6) in the opening (7) and turn the calibration screw until both lamps (9) light.
- Select the cyan channel – skipping the density channel – and again press the red button (10) while rotating the calibration screw with the screwdriver (6) through the opening (7) until both LEDs (9) light up.
- Once more check balance in all three positions and if necessary readjust the sensitivity control (in the yellow channel) or the calibration screws (magenta and cyan). Always keep to this order:

First correct the yellow channel, then the magenta and finally the cyan channel.



The LEDs must both light together in all three positions of the filter selector.
If you cannot manage to balance the yellow channel with the calibration screw, unscrew the magenta calibration screw as far as possible without obstructing the rotation of the filter selector and balance the magenta channel with the sensitivity control, then the yellow channel and finally the cyan channel with the calibration screw.
After this balancing sequence the CM 50 Color Meter is calibrated for the type of film in use, the paper emulsion, enlarger lamp, chemistry and lens. If any one of these five items is changed or modified you must make a new colour enlargement and reprogram the CM 50 Color Meter for the new filter settings.

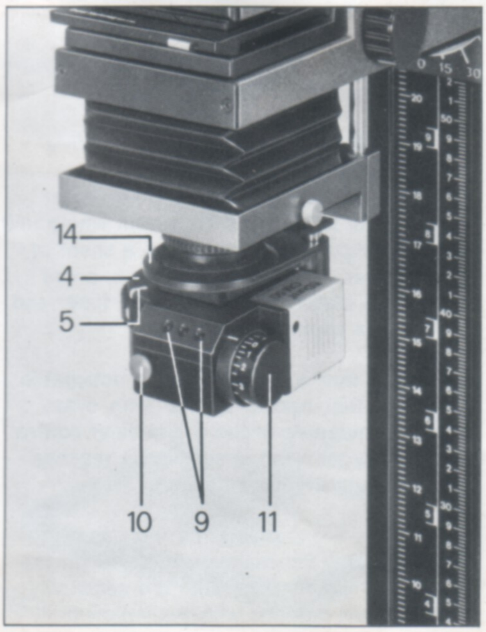
### 6.8.0 The Durst CM 50 in practice

Now you can start enlarging proper. For enlargements from other negatives proceed in the same way as when analysing the calibration negative (see section 6.1.0). You can of course now change the cropping or magnification of the negative to be enlarged in any way you like.

- Insert the new negative, focus the projected image and fully open the lens aperture.
- Turn the filter selector to the cyan channel by enganging the cyan dot on the wheel below the white index (5).
- Press the red button (10) and turn the sensitivity control (11) until both LEDs (9) are alight together.
- Turn the filter selector (4) clockwise to the yellow channel: engage the yellow dot on the wheel opposite the white index (5).
- Press the red button (10) and turn up the yellow filter setting in the colour head until both LEDs (9) are alight together.
- Turn the filter selector (4) further to the magenta channel, engaging the magenta dot on the wheel opposite the white index (5).

- Again press the red button (10) and adjust the magenta filter setting of the colour head until both LEDs (9) are alight together.
- Repeat this measuring procedure with the filters as set in the enlarger head, and balance – in this order – cyan with the sensitivity control, yellow and magenta with the corresponding filters in the colour head. The LEDs must light together in each of the three positions.
- Now withdraw the CM 50 Color Meter from the guides on the diffuser (14).
- Select the density channel and set the zero point of the sensitivity control (11) to the white index of the reference ring (12).
- Place the CM 50 with the measuring cell on the baseboard or masking frame, centering it exactly below the lens.
- Check that the diffuser (14) is in the light path, press the red button (10) and adjust the lens aperture until both LEDs (9) light together.

In this operation you thus use the lens aperture to match the light intensity to the



new negative or new magnification at a constant exposure time.
Hence the exposure time set on your exposure timer remains the same.

You have now analysed the new negative.

You can then push the CM 50 Color Meter back into its holder and swing the whole unit out of the light path. Then place a sheet of colour paper in the masking frame, press the release button of the exposure timer and process the exposed print.

If you find that a negative has a noticeable cyan cast that needs filtering with cyan, either the magenta or the yellow filter control on the enlarger head already have reached zero without achieving balance.

In this case set the magenta filter control to zero, select the magenta channel on the CM 50 and balance this with the sensitivity control. Then balance with the yellow and cyan filters of the colour head via the yellow and cyan channels of the CM 50.
If you want to make a very much bigger enlargement you may find that you do not achieve density balance even with the lens fully open. In that case switch the sensitivity control to the next higher full number (in the plus direction) and double the programming exposure time set on your exposure timer.

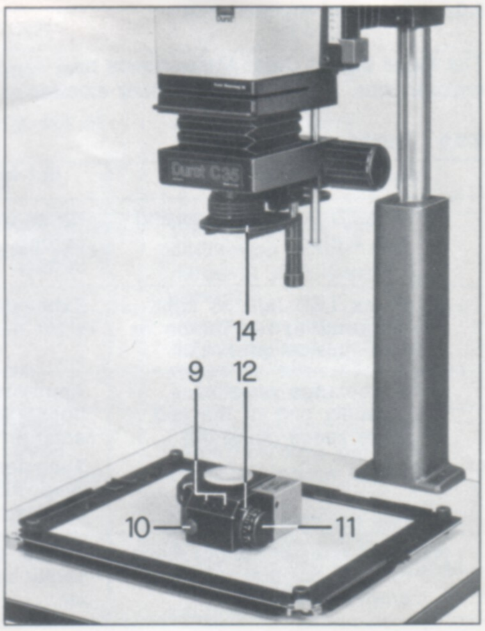
Now balance once more with the lens aperture. A full step of the sensitivity control is equivalent to a speed gain of one lens stop, requiring double the exposure time.

If you want to make a very much smaller enlargement you may fail to reach balance even at the smallest lens aperture. In that case switch the sensitivity control back by a full step (in the minus direction) and halve the exposure time set on the timer. Again balance now with the lens aperture adjustment.

## 7.0.0 Density measurement with the Durst CM 50 for black-and-white and transparency enlarging

The Durst CM 50 can also serve as a density meter for transparency and black-and-white enlargements. In this case it has to be calibrated as described in section 6.4.0. For black-and-white use a test negative of medium density – neither too thin nor too dense.

The same applies to the transparency (the colour distribution is here irrelevant).



### 8.0.0 Care and maintenance

The Durst CM 50 Color Meter needs no maintenance. But as with any other electronic precision instrument, avoid exposing the CM 50 to constant vibration or shocks. Also avoid corrosive vapours or direct action of acids (processing solutions).

### 9.0.0 Trouble shooting table

| FAULT | CAUSE | REMEDY |
|---|---|---|
| (1) No LED lights on pressing red button | No or wrongly inserted (wrong polarity) battery | Check that battery is correctly inserted |
| (2) Green LED fails to light on pressing red button or very quickly goes dim | Exhausted battery | Replace battery |
| (3) No balance possible because one of the red LEDs keeps going out | Appreciable voltage fluctuations affect enlarger light<br>Tungsten halogen lamp flickers due to oxidised lamp pins | Run enlarger via a voltage stabiliser<br>Change lamp and check contacts of lamp and fitting |
| (4) Filter selector cannot move to next position during programming | Yellow calibration screw unscrewed too far | Slightly screw in calibration screw |

| FAULT | CAUSE | REMEDY |
|---|---|---|
| (5) No balance possible during programming of yellow channel | Enlarger light not switched on<br>Filter swung out of light path<br>Lens not at full aperture | Switch on enlarger light<br>Move back filters<br>Open lens aperture fully |
| (6) No balance possible when programming with magenta channel | Magenta channel less sensitive than yellow channel | Balance yellow with calibration screw and magenta with sensitivity control |
| (7) Same colour cast obtained repeatedly when enlarging a number of negatives | CM 50 Color Meter incorrectly programmed | Select a negative of even colour balance, make an exposure sequence, correct and reprogram |
| (8) Strong colour cast of complementary colour to predominant image colour – for instance print of green meadow has magenta cast | Image contains excessive green (predominant colour) | Analyse a negative of the same film strip but with a balanced colour distribution<br>Enlarge anomalous negative with predominant colour using the same filter settings. Do not change the calibration |

| FAULT | CAUSE | REMEDY |
|---|---|---|
| (9) Yellow or magenta filter control of colour head reach zero during measurement without achieving balance | Cyan cast, needs correction with cyan filter | Balance calibration channel at zero filter setting with sensitivity control and the other two channels with filter controls of colour head |
| (10) During measurement colour balance is not possible in one of the three positions of yellow, magenta or cyan | Lens aperture not fully open | Fully open lens aperture |
| | Supplementary filter in light path | Remove supplementary filter |
| | Negatives require higher filter setting than 130 | Insert supplementary filter |
| | Filters swung out of light path | Return filters |
| (11) No density balance possible during measurement | Too high or too low magnification | Turn sensitivity control up by a full step (to double exposure time) or down (to halve exposure time) |
| | Density channel not selected | Select density channel |
| | Zero point of sensitivity control not lined up with white index of reference ring | Line up zero setting of sensitivity control with white index line of reference ring |

Durst products are constantly developed to the latest state of the art. Illustrations and descriptions are therefore subject to modification.

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